The International Comparison of Performance in Distribution

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Research Memorandum 537 (GD-2)

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The International Comparison of Performance in Distribution: Value Added, Labour Productivity, and Purchasing Power Parities in Mexican and US Wholesale and Retail Trade 1975/7

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Introduction

Since 1984, the ICOP (International Comparisons of Output and Productivity) project of Groningen University has produced more than 50 studies of comparative economic performance. Most of them dealt with commodity producing sectors (mainly manufacturing, but also with agriculture and mining), and 2 dealt with comparisons for GDP as a whole (Japan/USA, Korea/USA). The present study is the first of a series intended to provide careful scrutiny of major parts of the service sector.

In the advanced capitalist countries, services are now the dominant sector of the economy. When we look at GDP by industry of origin, services represented 69 per cent of value added and 72 per cent of total employment in the United States in 1987. When we look at GDP from the expenditure side, the share of services is considerably smaller. The most important "disguised" service is distribution (i.e. wholesale and retail trade), because it is an intermediate "activity" which is mainly embodied in final consumer expenditure and to a smaller degree in purchases of capital goods. Distribution is the biggest "disguised" service item, but there are other services of this kind, e.g. goods transport. Services of a "final" character such as education, health, recreation, house rentals, barber and beauty services, home help, government services and part of transport figure explicitly in the expenditure accounts.

In Kravis, Heston and Summers (1982, p.272) services represented 47 per cent of US GDP from the expenditure side in 1975, whereas the service share from the production side was 64 per cent; in Mexico, services represented 27 per cent of GDP from the expenditure side in that year and 52 per cent from the production side.

There have been relatively few attempts to make international comparisons of real output in distribution. The major studies are by Hall, Knapp and Winsten (1961) and Smith and Hitchens (1985). Intertemporal analysis in this field has also been rather limited and is concentrated on the USA. The major studies are by Barger (1955), Schwartzman (1969 and 1971), and Oi (1992). From the Barger-Oi analysis it is clear that rising US real income has been accompanied by an increase in the importance of distribution. In 1900, 8 per cent of US employment was in distribution compared with 20 per cent in 1980. Over the same period the proportion employed in goods production fell from 62 per cent to 27 per cent, so that the ratio of employment in distribution to that in goods rose from 13 per cent to 77 per cent from 1900 to 1980. The proportionate change in labour input was smaller than in employment because the proportion of part-time workers, women and juveniles rose a good deal faster in distribution than in goods production. Working hours per person have fallen more in distribution than in goods production.

In 1900, hours in distribution were higher than in goods production, whereas in 1989 average weekly hours in wholesale and retail trade were 31 compared with 41 in US manufacturing (see BLS, 1991). There was also an appreciable fall in the relative earnings of distributive workers, so the relative change in employment exaggerates the quality and quantity of labour in distribution. Nevertheless the rise in the relative importance of distribution has been quite spectacular.

The nature of the services provided by distribution has changed over time. The proportion of goods directly consumed by those who produced them has declined as society became more urban and less agricultural. The proportion of goods sold by pedlars, street vendors and in open air markets has declined. A much higher proportion of goods are advertised items with brand names and standardised quality. Many more are prepackaged, the array on display provides for a bigger range of consumer choice. The widespread ownership of automobiles and domestic refrigeriation has made it easier to shop quickly in super markets with parking facilities and to make fewer shopping trips because of bulk purchases. The counterpart of this is that the number of neighbourhood shopping outlets with long opening hours, friendly neighbourhood gossip, delivery services and informal credit arrangements has declined drastically. All these differences make it difficult to assess the nature of the services and satisfactions being supplied. Schwartzman (1971) suggests that the quality of distributive services has declined over time in the USA. This is clearly a sector which is measurement resistant to a larger extent than most commodity producing sectors.

Summary of Main Findings

In this study we relied mainly on information contained in censuses for Mexico and the USA, which we reclassified in a standard format, showing a breakdown for the ten main branches. From these sources we derived comparable estimates of the value of sales and gross value added, as well as employment (which we had to adjust in the case of the USA to include family workers and working proprietors). In order to get the same coverage for the two countries we had to exclude a number of items[1] from the US censuses of wholesale and retail trade, as they could not be matched with items of the Mexican census of distribution. Sales of the excluded US trades were 4.0 per cent of those in our sample, 9.5 per cent of value added and 18.1 per cent of persons

[1] In wholesale trade these items were for wholesale trade: used automotive parts and equipment; metals service centers and offices; other durable goods, not elsewhere specified; industrial and personal service paper; bread and baked goods; art goods; optical and ophthalmic supplies, and other non-specified nondurables. In retail trade the excluded trades were mobile home dealers; candy, nut and confectionary stores; retail bakeries; boat dealers; gift, novelty, and souvenir shops, optical goods stores, and other types of non-specified retail trades.

engaged. For Mexico, we also had to exclude a number of trades[2] which could not be matched with US statistics. Sales of excluded Mexican trades were 5.4 per cent of our sample, 6.7 per cent of value added, and 3.9 per cent of persons engaged.

Our main innovation is to experiment with a measure of value added in comparable prices by double deflation, using ICP expenditure PPPs as our converters for sales, and ICOP PPPs as converters for purchases of goods produced in other industries which are destined for resale and for other inputs such as transport, energy, etc.

Other analysts, e.g. Hall, Knapp and Winsten (1961) and Smith and Hitchens (1985) used a simpler approach, adjusting both sales and purchases by ICP expenditure PPPs. In this paper we used Kravis, Heston and Summers (1982) ICP PPPs for sales, and ICOP studies (an amended version of Maddison and van Ark (1989) and Mulder (1991)) for the "input" PPPs.

With our double deflation approach, labour productivity (value added per person engaged) in Mexican distribution was 36.9 per cent of that in the USA. Using the traditional single deflation technique, labour productivity was substantially lower at 28.4 per cent of the USA. The detailed results for the ten branches using double deflation were quite erratic (see Table 6 and 7 below). At the aggregate level they may have greater validity as errors may be compensating. We conclude that Mexican labour productivity in distribution in 1975 lay in a range between 28.4 and 36.9 per cent of the USA, but the lower of these two figures (using single deflation) probably deserves greater credence.

The average size of establishment (measured by persons employed) was almost four times as big in the USA as in Mexico (see Table 9). In the case of food products, the average US store had 6 times as many persons engaged than a Mexican store.

We had major problems in reconciling the census record of value added and employment with the national accounts for Mexico, whereas the reconciliation problem was much smaller for the USA. In Mexico, value added reported in the census was only 36 per cent of that in the national accounts. It seems inconceivable that the census could have missed such a large proportion of distributive activity. Even less plausible is the fact that the apparently non covered outlets had a considerably higher labour productivity than the covered outlets. Our experience was not new, Maddison and van Ark (1989) had similar problems in reconciling the Mexican census and national accounts for manufacturing.

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[2] Trades excluded from our comparison were: glasses and accessories; paintings, sculptures, and other art works, including religious objects; antiques, craftmen's products, gifts, including bazars; skins and furs; non-specified basic materials; aircrafts, boats and other non-specified transport equipment; real estate; fire arms; ticket offices for lotteries; veterinary products and other products for animal care; and products not elsewhere classified.

Survey of Previous Comparisons of Distribution Value Added, Productivity and/or PPPs

This section summarises the methods and concepts used in four estimates of long term trends in US distribution and eight earlier international productivity comparisons for distribution.

a) Studies of the Growth of US Distribution over Time

Barger (1955). 27 Types of retail trade.

(Intertemporal comparison (1869-1949) of output and productivity in US distribution)

Barger defined "gross margins" (i.e. value added) as sales less the cost of goods purchased. Growth of "net output" (value added) over time was measured as retail sales of finished goods adjusted to a constant price basis, and weighted by 1869 and 1929 "value added" in different types of retail trade. His final index was the mean of the 1869 and 1929 measures. He made no quality adjustment. Prior to 1929, he estimated retail sales by a mark-up on commodity output, i.e. he added transport costs, wholesale and retail trade markups to the value of commodity production. For years after 1929, he derived sales directly from the censuses of distribution for 1929, 1939 and 1948). Margins were estimated using census material, other published information, and unpublished records of individual enterprises. Productivity, measured as weighted sales per man-hour, rose at a compound annual rate of 1.0 per cent during the period 1869-1949.

Schwartzman (1969 and 1971). In these two studies (1971 is a substantial elaboration of the 1969 article) Schwartzman made an intertemporal comparison (1929-1963) for 8 types of US retail trade of output and labour productivity which stresses the changing character of services rendered by retailers. He concludes that the quality of retail services declined in the period convered and also that the quality of the labour input in retailing declined because of a decline in working hours and relative earnings in this sector compared with the rest of the economy. Output was measured as sales in constant prices. Labour productivity, measured as sales in constant prices per man-hour, grew at a compound annual rate of 1.7 per cent. Conventional sources of productivity growth were analysed, such as improvements in the quality of labour, increases in capital per man-hour and economies of scale. Together they do not, on balance, explain any of the productivity increase. Demand for retail services, income and price elasticities were estimated using regression analysis. Schwartzman observed a decrease in the quantity of service per transaction in response to an increase of the price of retail services. The average size of transaction also increased. Less retail services and bigger average transactions explain almost all of the productivity increase.

Ratchford and Brown (1985). Study of productivity changes in US food retailing for the period 1959 to 1979. Output is measured as constant dollar value added. Services of food retailers were assumed to be proportional to value added in constant prices. So there was no adjustment for quality. Productivity changes were measured by the percentage change in real value added less a weighted sum of the percentage rates of change of the various inputs. Labour input was measured in terms of hours paid estimated as by the Bureau of Labor Statistics. They made no quality adjustments to labour input. Five types of capital (equipment, inventories, land, structures and capital rented from others) and two types of ownership (corporate and non-corporate) were combined using rental shares as weights. Intermediate services were the third input. Current dollar values of labour, capital and intermediate services expenses were used as weights. They estimated that total factor productivity rose between 1959 and 1979 at an annual rate of around 1 per cent.

Griliches ed. (1992). Services covered are retail trade, financial services (banking and stock exchange), education, day-care industry, transportation, and the public sector.

Contains a paper by Oi updating (to 1980) Barger's intertemporal comparison (1869-1949) of output and productivity in US retail trade. Labour costs in retailing have risen over time. This caused substitution from labour intensive methods to self-service. The quality of the labour force in distribution over time declined, because of an increase of the proportion of women and part-timers, and because of a greater use of less-skilled workers. Value added per hour worked rose at a compound annual rate of 2.45 per cent in wholesaling and 1.76 per cent in retailing.

b) International Comparisons of Performance in Distribution

Some of the previous international comparisons only dealt with retailing (Jefferys and Knee (1962) and McKinsey (1992)), but others also included wholesaling. There are important differences between the studies. Different measures of output were applied: Paige and Bombach (1959) used quantities of goods produced weighted by gross margins; Hall, Knapp and Winsten (1961), and Jefferys and Knee (1962) used sales; Smith and Hitchens (1985) used gross margins; and Pilat (1991) and McKinsey (1992) used value added.

All the studies quoted below measure output in a common set of prices, using exchange rates or PPPs for total consumer expenditure or ICP PPPs for specific product groups. These PPPs were also used to convert gross margins (Smith and Hitchens, 1985) or value added (i.e. Pilat (1991) and McKinsey (1992)). ICP expenditure PPPs were applied to retail trade and to wholesale trade.

Measures of labour input have also varied. Apart from paid employees and proprietors, some studies include family workers (Barger (1955), Paige and Bombach (1959), Hall, Knapp and Winsten (1961) and Jefferys and Knee (1962)). All the studies adjust labour input to a full-time equivalent basis. Barger (1955) and Pilat (1991) also show hours worked. Smith and Hitchens (1985) estimate capital productivity, measured as sales per square foot of store space. McKinsey (1992) used retailers' inventories of saleable goods as their measure of capital and estimated total factor productivity, combining labour and capital inputs.

Hall, Knapp and Winsten (1961) and Smith and Hitchens (1985) were the only studies relying entirely on censuses of distribution; Barger (1955) and Pilat (1991) did so to some extent. The Barger (1955) pre-1929 estimates and the Paige and Bombach (1959) estimates were derived from adjusted figures of commodity output. Barger added transport costs and wholesale and retail mark-ups to production. Paige and Bombach weighted production data by distributive margins. Jefferys and Knee (1962) estimated retail output from data on consumer expenditure.

Paige and Bombach (1959). 2 Countries (UK and USA). 14 types of retail trade and 4 types of wholesale trade. Their estimates for distribution were part of a more general comparison of gross value added, labour productivity and PPPs for total GNP for 1950.

The volume of goods distributed was measured by intercountry relatives for commodity production, adjusted for exports and imports. Volume indicators for each country were weighted by "own" and "other country" gross margins for different types of trade. No adjustment was made for quality of service. Sources were the UK Census of Distribution 1950 and data from the US Department of Commerce. The margin of error in estimating the weights was believed to be considerable, because of the difficulty of "matching" the production indicators and distributive margins. Labour productivity was measured in terms of output per full-time equivalent worker. Labour input was not adjusted for differences in hours worked. For 1950, they found US output per full-time equivalent worker to be 193 per cent of the UK at UK prices and 164 per cent at US prices.

Hall, Knapp and Winsten (1961). 3 Countries (Canada, UK and USA). 19 types of retail trade and 21 types of wholesale trade.

Gilbert and Kravis (1955) Paasche and Laspeyres PPPs for different groups of consumer expenditure were used as the converters for sales. No quality adjustment was made. Censuses of distribution were the source. Labour productivity was measured in terms of sales per full-time equivalent worker. Two part-time employees were considered equal to one full-time equivalent employee. US labour productivity in 1948 was found to be 217 per cent, and

Canadian labour productivity 212 per cent of the UK level in 1950.

Jefferys and Knee (1962). 18 Countries (Europe and the USA). No breakdown by type of retail trade. Wholesale trade not included.

Sales converted to US dollars by exchange rates and also by Gilbert and Associates (1958) Paasche PPPs for total consumer expenditure. A variety of sources was used, including censuses of distribution, official sources, population censuses and data on private expenditure. Labour productivity was measured in terms of sales per full-time worker engaged. Two family workers or part-time employees were considered equal to one full-time employee. In Europe, the lowest labour productivity was found to be in Portugal and the highest in Norway in 1955. The US level was 163 of that of Norway.

Smith and Hitchens (1985). 3 Countries (Germany, UK and USA). 26 types of retail trade and 15 types of wholesale trade.

The converters for gross margins and sales were ICP II and III Paasche and Laspeyres PPPs. There was no quality adjustment. Labour productivity was measured in terms of gross margins or sales per person engaged. Capital productivity was expressed as sales per square foot of store space. The sources were censuses of distribution. They found that US sales per person engaged were 215 per cent, and German sales per person engaged were 127 per cent of the UK level in 1971.

Nooteboom, Thurik and Vollebregt (1986). International comparison of structural changes in retai ling in 24 countries. Structural changes in food retailing were analysed looking at the average sales per shop, the number of shops per 1,000 inhabitants, the share of independents, and concentration as measured by the share of sales of the top 2 per cent of companies. Comparing the observed phenomena in different countries, they discern a three-stage development process of retail structure. In the first stage they find a stable and dense structure of small and independent shops with limited self-service (typical for less developed countries). The second stage consists of a 'industrialisation' of retailing, with more self service, increase in scale and concentration, declining share of independents and a declining density of shops. The third stage is characterised by stabilisation of scale, density and share of independents. Portugal was in the first stage, Northwestern European countries were in the second and the USA was in stage 3.

Pilat (1991). 2 Countries (Japan and USA). 7 groups of retail trade and 6 groups of wholesale trade.

Part of a comparison of gross value added, labour productivity and PPPs for total GDP for 1975 and 1970-85 for Japan and the USA.

Laspeyres and Paasche PPPs from ICP III were applied to convert Japanese and US sales (6 categories of wholesale trade and 7 for retail trade), and reweighted according to sales. The aggregate PPPs for wholesale and retail trade were used as converters for GDP in these 2 sectors. Labour productivity in wholesale and retail trade was shown in terms of persons engaged and GDP man-hour worked. No adjustment was made for quality of services. Sources were the Japanese Census of Commerce, the US Statistical Abstract and national accounts data. Japanese value added per person engaged in distribution was 57.8 per cent of the US level in 1975 (a good deal higher than the McKinsey results for the same year.

Ito and Maruyama in Krugman (ed.) (1991). 3 Countries (Germany FR, Japan, and USA). No breakdown for types of retail and wholesale trade. No quality adjustments were made. Persons engaged was the total of full-time and part-time paid employees and proprietors, with no adjustment to a full-time equivalent basis. Labour productivity was measured as sales per person engaged. German and Japanese sales were converted to US$ using ICP PPPs for total GDP. In 1982, Japanese labour productivity (sales per person engaged) in wholesaling was found to be 143 per cent of the US level, and in retailing 91 per cent. German labour productivity was 63.7 per cent of the USA for wholesaling and 75.0 per cent for retailing for the same year. Ito and Maruyama give two reasons why Japanese productivity results may be biased upwards. Firstly, wholesale productivity may be overestimated because large scale trading houses were included in wholesaling. These wholesalers engage in export, import and international trade between other countries. Retail productivity could be biased because of the great number of 'persons on loan' from manufacturers or wholesalers in department stores, which were excluded from the estimates of persons engaged for retailing. How these biases affect the productivity results was not explained.

McKinsey Global Institute (1992). 5 Countries (France, Germany, Japan, UK and USA). Retailing of consumer durables and semi-durables, excluding automotive goods.

(part of a comparison of output, value added and labour productivity in airlines, retail banking, restaurants, general merchandise retailing and telecommunications)

Converters for sales and value added were 1990 Eurostat Fisher PPPs for total consumption. Labour productivity was measured as value added per full-time equivalent worker, with 2 part-time workers assumed to be equal to 1 full-time worker. Capital productivity was calculated as

value added per unit of retailers' inventories of saleable goods. Total factor productivity was estimated by weighting these labour and capital inputs with the respective shares of labour and capital in value added. Surveys and company specific data were the sources. The McKinsey Institute found that US productivity was the highest but considered its productivity estimates to have a degree of uncertainty, arising from the use of aggregate PPP converters and the inadequacy of some of the employment information. It found value added per employee to be 96 per cent of that in the USA for Germany, 82 per cent for the UK, 69 per cent for France and 44 per cent for Japan for 1987.

Matching Retail and Wholesale Trade

The Mexican Standard Industrial Classification (*Catalogo Mexicano de Actividades Economicas 1976*, SPP) does not distinguish between retail and wholesale trade. The US *Standard Industrial Classification 1972* (Executive Office of the President, 1972) treats retailing and wholesaling separately. We therefore combined US wholesaling and retailing activities for specified products or product groups in order to compare them with Mexico. Our matching procedure and the nomenclature for the two countries are shown in the appendix tables A1 to A3. In our detailed calculations we distinguished 28 product groups, but, in this paper, we have consolidated our results into ten groups (see Appendix Table A4).

The censuses contain a large amount of information on sales, type of outlet, paid employment, size of establishments[3] and firms (measured by sales and number of paid employees), legal form of organisation and concentration ratios. The Mexican census includes unpaid family workers and proprietors, whereas the US censuses do not. The censuses do not contain data on quantities of products sold; only money values of total sales are listed.

Census data on purchases of goods by distributive establishments, inventory changes and other input costs are available only for Mexico. US censuses do not contain such data, but the relevant information can be derived from other sources[4] on a somewhat more aggregate level than is generally used in the census. For wholesale trade, information on input costs is only available for merchant wholesalers. They accounted for 53.7 percent of sales and 79.5 of establishments in wholesale trade. The non-merchant wholesalers are essentially branches which manufacture and

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[3] An establishment is defined by the censuses as a single physical location at which business is conducted. A firm is either a single establishment (single unit) firm or a multi-establishment (multi-unit) firm. Therefore, one firm can operate several establishments.

[4] *1977 Characteristics of Retail Trade* and *1977 Merchant Wholesalers* (Bureau of the Census (1981)). These sources show sales, purchases of goods, inventory changes and other input costs on a 2 digit level for wholesaling and resaling.

sell goods themselves and sell directly to retailers. Ratios of input costs to sales of merchant wholesalers were assumed to be representative also for other types of wholesale trade.

Our census data for sales for the USA are for 1977 in 1977 prices. In order to compare with Mexico in 1975, US sales data were adjusted to 1975 prices using consumer price indices in the case of retailing, and wholesale (producer) price indices in the case of wholesaling. Price indexes were taken from two publications of the US Bureau of Labor Statistics[5]. Subsequently, we applied ratios of purchased goods, and other inputs to sales derived from the Bureau of the Census (1981) (see footnote 4) to estimate gross margins and value added for individual trades (3 or 4 digits).

We define value added to correspond to the national accounts concept at present in use (see Maddison and van Ark (1989)). The definition of Mexican census value added is not the same as the US value added concept used in the *1977 Characteristics of Retail Trade* and the *1977 Merchant Wholesalers* (Bureau of the Census (1981)). The Mexican and US statistics contain enough information to arrive at an estimate which corresponds with the national accounts concept. Table 1 presents the procedure used to estimate the national accounts concept of value added for establishments covered by the Mexican *VII Censo Comercial 1976, Datos de 1976* (SPP, 1981). In the national accounts, gross value of output for distribution is equal the gross margin. Items 3 a) to 3 e), 4 a) and 4 b) are defined in this paper as "other inputs".

Derivation of gross value added for the USA is shown in Table 2.

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[5] *Consumer Prices and Price Indexes*, various issues; *Wholesale Prices and Price Indexes , Supplement 1976: Data for 1975*; *Producer Prices and Price Indexes, Supplement 1978: Data for 1977.* Price indexes are given for individual products at a very detailed level. Annual averages were used to calculate price changes.

Table 1
Procedure Used to Estimate the National Accounts Concept of Gross Value Added (contribution to GDP at Factor Cost) for Establishments covered by the Mexican Census of Distribution, Mexico, 1975

1) Sales and other receipts = "ventas netas mas ingresos diversos";

2) Gross margin ("margen bruto de operacion") = sales and other receipts ("ventas netas mas ingresos diversos") minus cost of goods sold ("costo de las mercancias vendidas");
("costo de las mercancias vendidas" = value of the inventory of goods at the beginning of the year, plus the purchases of goods during 1975, and minus the value of the inventory at the 31st of December of that same year ("el valor de las mercancias en existencia a una fecha dada, más el importe de las compras realizadas durante el año de 1975, menos el valor de las existencias al 31 de diciembre del mismo año"));

3) Mexican census value added ("valor agregado censal bruto") = gross margin ("margen bruto de operacion") minus the following items:
   a) "envases y empaques utilizados" (packaging);
   b) "energia electrica comprada" (electric energy used);
   c) "pagos por comisiones sobre ventas" (sales commissions);
   d) "pagos por servicios de propaganda y publicidad" (advertising cost);
   e) "Otros bienes y servicios" (other goods and service inputs);

4) In order to arrive at the present national accounts concept of gross value added, we must further deduct two items:
   a) "Gastos por uso de patentas y marcas, asistencia tecnica y otros pagos por tecnologia" (cost of patents, licences, technical assistance, and technology);
   b) "Gastos por rentas y alquileres" (cost of renting).

Source: SPP (1981), *VII Censo Comercial 1976, Datos de 1975*.

Note: Items 3 a) to 3 e), 4 a) and 4 b) are part of "other inputs".

Table 2
Procedure Used to Estimate the National Accounts Concept of Gross Value Added (contribution to GDP at Factor Cost) for Establishments Covered by the *1977 Merchant Wholesalers* and the *1977 Selected Characteristics of Retail Trade*, USA, 1977

1) Sales;

2) Gross margin = sales less the cost of goods sold
(cost of goods sold = value of inventory of goods for resale at 31st December 1976, plus purchases of goods during the year, minus value of inventory of goods at 31st December 1977);

3) US value added = gross margin less the cost of:
   a) containers, packing, selling, and wrapping supplies;
   b) office supplies, stationary, and postage;
   c) fuels consumed;
   d) purchased electricity;

4) In order to arrive at the present national accounts concept of gross value added, we must further deduct four items:
   a) purchased advertising services;
   b) purchased communication services;
   c) lease and rental payments;
   d) purchased repair services;

Sources: *US Bureau of the Census (1981): 1977 Selected Characteristics of Retail Trade*, and *1977 Merchant Wholesalers*.

Note: Items 3 a) to 3 d), and 4 a) to 4 d) are part of "other inputs".

Table 3 is the first element in our comparative presentation. It shows sales and value added (national accounts concept) in Mexico and the USA in dollars (with Mexican sales converted at the exchange rate). Table 3 also shows the proportion of goods purchased by distributive establishments (including changes in value of inventory during the period considered). Ratios of purchased goods to sales were higher in the USA than in Mexico for all trades, except clothing and footwear. The highest percentages were found in farm products for both countries, the distribution of motor vehicles and petroleum products in the USA, and food products in Mexico. Low ratios of purchases to sales can be seen in clothing and footwear, and general line products in the USA and in machinery, equipment and supplies in Mexico.

Table 3 also shows ratios of inputs and purchases to sales. The average ratio of other inputs to sales was twice as great in Mexico as in the USA.

Table 3
Sales, Value Added, Ratio of Purchased Goods to Sales and Ratio of Inputs to Sales in Retail and Wholesale Trade, Mexico and the USA, 1975/77 (million 1975 US$, with Pesos Converted by the Exchange Rate)

	Sales		Value Added		Ratio of purchased goods to sales		Ratio of other inputs to sales	
	USA 1977	Mexico 1975	USA 1977	Mexico 1975	USA 1977	Mexico 1975	USA 1977	Mexico 1975
(1) Farm products	163,825	833	12,883	189	90.4	72.6	1.8	4.7
(2) Food products	321,313	6,930	49,895	1,514	80.6	71.1	3.9	7.1
(3) Alcoholic beverages and tobacco products	48,076	937	8,537	171	76.2	67.8	6.1	14.0
(4) Clothing and footwear	69,897	1,835	18,246	480	64.2	65.7	9.7	8.2
(5) Furniture, furnishings, and appliances	111,776	1,286	25,450	395	72.2	59.2	5.0	10.1
(6) Building materials, hardware	95,555	2,195	21,699	564	73.3	67.5	4.0	6.8
(7) Machinery, equipment, scrap and supplies	209,137	1,957	52,985	633	70.4	58.0	4.3	9.6
(8) Motor vehicles and petroleum products	404,203	4,908	63,499	1,101	81.0	69.7	3.3	7.9
(9) General line products	90,041	1,338	27,000	455	63.0	59.1	7.1	6.9
(10) Other	127,226	2,824	27,354	720	74.8	67.1	3.7	8.7
TOTAL (All Branches)	1,641,048	25,043	307,547	6,221	77.1	67.3	4.1	8.0

Sources:
Mexico: SPP (1981), *VII Censo Comercial 1976, Datos de 1975*: Table 35: Ventas Netas Mas Ingresos Diversos, Insumos Totales y Valor Agregado Censal Bruto por Clase de Actividad y Estrato de Personal Ocupado; USA: neither census (Department of Commerce, Bureau of the Census (1981), *1977 Census of Retail Trade* and *1977 Census of Wholesale Trade*) contains data on on purchases of goods by distributors and value added. Two other publications of the Bureau of the Census (1981), *Characteristics of Retail Trade* and *1977 Merchant Wholesalers*) were used to estimate purchased goods and value added as a percentage of sales for different kinds of trade. US prices adjusted to a 1975 basis by price indexes derived from Bureau of Labor Statistics (various issues), *Consumer Prices and Price Indexes* (applied to retail trade); and BLS (1976), *Wholesale Prices and Price Indexes, Supplement 1976, Data for 1975*; and BLS (1978), *Producer Prices and Price Indexes, Supplement 1978, Data for 1977* (applied to wholesale trade).

Derivation of PPPs for Gross Value Added

We can now move from Table 3, and substitute PPP converters for the exchange rate. We used both the double deflation technique, and the more traditional single deflation technique.

I. Derivation of Gross Value Added in A Common Currency with Double Deflation

(a) PPPs for Sales

The first step was the detailed conversion of Mexican and US sales by ICP Paasche and Laspeyres PPPs (kindly supplied by Alan Heston). Detailed binary PPPs are presented in Appendix Table A5 and A6 and Paasche and Laspeyres PPPs for broad product categories are shown in Table 4-A. The PPPs for "general line products" were assumed to be the same as the average PPP for the other 9 items.

(b) PPPs for Goods Purchased

We used Paasche and Laspeyres PPPs derived from the Groningen ICOP studies for purchases of goods by distributors from other sectors of the economy for resale. This was the second step in the process of double deflation (see Appendix Table A7 and A8 for the detailed procedure). ICOP binary PPPs for broad product groups are shown in Table 4-A.

We now arrive at a first approximation to gross value added, i.e. sales less the cost of goods purchased by distributive establishments (i.e. value of inventories at the beginning of the year, plus purchases of goods during the year and less the value of inventories at the end of the year) during the period considered.

(c) PPPs for other Inputs

Next we deducted other inputs such as advertising, energy and space rental costs. The procedure for making these further deductions is shown in Appendix Table A9 and A10. The Mexican distributive census gives information on a number of these other inputs. We had ICOP Paasche PPPs for electricity from Mulder (1991) and for packaging materials from a revised version of Maddison and van Ark (1989).

The input-output table (*Matriz de Insumo-Producto 1975*, SPP 1981) is another source from which information can be obtained on input costs: it appears that transport costs were a significant input (i.e. 10.5 per cent of total "other" input costs). We applied this percentage to each trade and subsequently converted transport cost in pesos to US$ using the ICOP Paasche PPP for transport in Mulder (1991). The sum of electricity, packaging materials and transport costs represented 1.5 per cent of total inputs (including purchases of goods for resale).

per cent of total inputs (including purchases of goods for resale).

No ICOP PPPs were available to convert the remaining input costs listed in the Mexican census, such as advertising, technical services, rental costs, etc.. These conversion-resistant inputs represented 6.0 per cent of total inputs (including purchases of goods for resale).

We used a weighted average of the ICOP Paasche PPPs for electricity, packaging materials and transport costs to convert the residual input costs in pesos to US$, as is shown in column 5 of Appendix Table A9. Total input costs and gross value added in US$ are listed in column 7 and 8.

Neither of the US censuses contained data from which we could derive input costs. Two other sources were used instead, i.e. *1977 Selected Characteristics of Retail Trade* and *1977 Merchant Wholesalers* (Bureau of the Census (1981)). ICOP Laspeyres PPPs were available for the following inputs listed in these documents: communications and electricity from Mulder (1991), and fuels, office supplies, and packing and wrapping materials from a revised version of Maddison and van Ark (1989), see Appendix Table A10. The sum of these inputs accounted for 1.7 per cent of total inputs (including purchases of goods for resale). As for Mexico, a weighted average of the ICOP Laspeyres PPPs for these inputs was used to convert the residual input costs to pesos. The residual conversion resistant inputs represented 3.4 per cent of total inputs (including purchases of goods for resale).

(d) Implicit PPPs for Value Added

We can now derive implicit Paasche and Laspeyres PPPs for gross value added, as shown in Table 4-A, by dividing for Mexico the pesos value of gross value added by our double deflated Paasche estimate. For the USA, the implicit Laspeyres PPP for value added is found by dividing the double deflated Lapeyres value added estimate in pesos by value added in US$. We estimated the Paasche PPP for distribution as a whole to be 5.80 and the Laspeyres PPP to be 13.83 for gross value added.

Table 4-B shows the ICP Fisher PPPs for sales, the ICOP Fisher PPPs for purchases and for other inputs, and the implicit Fisher PPPs for value added, derived by taking the geometric average of the Paasche and Laspeyres PPPs.

Table 4-A

ICP Paasche and Laspeyres PPPs for Sales, ICOP Paasche and Laspeyres PPPs for Purchases and Other Inputs, and Implicit Implicit Paasche and Laspeyres PPPs for Value Added, Retail and Wholesale Trade, Mexico and the USA, 1975/7

	Paasche PPPs (i.e. at Mexican Quantity Weights)				Laspeyres PPPs (i.e. at US Quantity Weights)			
	ICP PPP for sales	ICOP PPP for purchases	ICOP PPP for other inputs	Implicit PPP for value added	ICP PPP for sales	ICOP PPP for purchases	ICOP PPP for other inputs	Implicit PPP for value addec
(1) Farm products	12.49	11.00	12.63	22.02	17.31	15.28	16.45	40.73
(2) Food products	7.31	8.04	12.76	5.10	9.82	13.29	15.91	-9.72
(3) Alcoholic beverages and tobacco products	7.25	14.40	11.79	2.31	11.32	12.50	15.91	4.70
(4) Clothing and footwear	11.87	14.33	12.26	8.24	15.95	15.16	16.32	17.77
(5) Furniture, furnishings, and appliances	5.75	21.01	11.44	2.24	13.00	15.67	15.24	4.04
(6) Building materials, hardware	5.56	13.10	11.59	2.10	9.75	19.72	15.36	-23.42
(7) Machinery, equipment, scrap and supplies	14.93	11.99	11.37	31.98	19.66	14.92	15.69	33.50
(8) Motor vehicles and petroleum products	15.55	13.69	11.31	34.84	16.65	13.59	15.12	32.74
(9) General line products	9.15 a)	10.71 a)	12.34	7.01	14.20 a)	14.54 a)	16.12	13.05
(10) Other	12.48	13.91	12.16	9.88	13.09	16.17	16.33	1.82
TOTAL (All branches)	9.15	10.71	11.95	5.80	14.20	14.54	15.75	13.83

Sources: Appendix Tables 9 to 12. ICP augmented binary PPPs for sales from worksheets from Kravis, Heston and Summers (1982); ICOP binary PPPs for purchases and other inputs from Houben (1990), a revised version of Maddison and van Ark (1987), Maddison and van Ooststroom (1993), and Mulder (1991).

(a) This branch essentially refers to the activity of department stores. We simply assumed that the PPP for this branch was the same as the average for the 9 other branches.

Table 4-B

ICP Fisher PPPs for Sales, ICOP Fisher PPPs for Purchases and Other Inputs, and Implicit Fisher PPPs for Value Added, Mexico and the USA, 1975/7

	ICP Fisher PPP for sales	ICOP Fisher PPP for purchases	ICOP Fisher for other inputs	Implicit Fisher PPP for value added
(1) Farm products	14.70	12.96	14.41	29.95
(2) Food products	8.47	10.34	14.25	a)
(3) Alcoholic beverages and tobacco products	9.06	13.42	13.69	3.29
(4) Clothing and footwear	13.76	14.74	14.14	12.10
(5) Furniture, furnishings, and appliances	8.64	18.14	13.20	3.01
(6) Building materials, hardware	7.36	16.07	13.34	a)
(7) Machinery, equipment, scrap and supplies	17.13	13.37	13.36	32.73
(8) Motor vehicles and petroleum products	16.09	13.64	13.08	33.77
(9) General line products	11.40	12.48	14.11	9.56
(10) Other	12.78	15.00	14.09	4.24
TOTAL (All branches)	11.40	12.48	13.72	8.96

Sources: Table 4.

a) Fisher PPP cannot be calculated because Laspeyres PPP is negative.

In Table 5, gross value added data converted with the implicit Paasche and Laspeyres PPPs are presented. In some cases there were PPPs only for part of the products included in a product group (for furniture, home-furnishings and appliances, double deflation could be applied only to appliances). However, the derived implicit PPPs for value added in Table 4 were assumed to be representative also for trades we could not include in the double deflation procedure.

Table 5
Double Deflation: Gross Value Added in Wholesale and Retail Trade
Mexico and the USA, 1975/7

	at Mexican "Prices" a)			at US "Prices" b)			Geometric average of column 3 and 6 (Fisher)
	Mexico, 1975 (million 1975 pesos)	USA, 1977	Mexico/ USA (%)	Mexico, 1975 (million 1975 US$)	USA, 1977	Mexico/ USA (%)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Farm products	2,359	524,674	0.45	107	12,883	0.83	0.61
(2) Food products	18,922	-485,030	d)	3,712	49,895	7.44	c)
(3) Alcoholic beverages and tobacco products	2,137	40,085	5.33	927	8,537	10.85	7.61
(4) Clothing and footwear	5,995	324,262	1.85	728	18,246	3.99	2.72
(5) Furniture, furnishings, and appliances	4,931	102,748	4.80	2,201	25,450	8.65	6.44
(6) Building materials, hardware	7,047	-508,151	d)	3,356	21,699	15.47	c)
(7) Machinery, equipment, scrap and supplies	7,916	1,774,890	0.45	247	52,985	0.47	0.46
(8) Motor vehicles and petroleum products	13,763	2,079,027	0.66	395	63,499	0.62	0.64
(9) General line products	5,689	352,227	1.62	811	27,000	3.00	2.20
(10) Other	9,000	49,868	18.05	911	27,354	3.33	7.75
TOTAL (All branches)	77,759	4,254,599	1.83	13,396	307,547	4.36	2.82

Sources: Table 3, 4-A and 4-B.

a) US gross value added converted to pesos with Implicit Laspeyres PPPs for value added;
b) Mexican gross value added converted to US$ with Implicit Paasche PPPs for value added;
c) No Fisher PPP available, see Table 4-A.
d) Ratio cannot be calculated because US gross value added at Mexican Prices is negative.

II. An Alternative estimate of Mexico/USA Value Added Using the Traditional Single Deflation Technique

As a crosscheck on our double deflation technique, we used traditional single deflation. Table 6 shows the ICP reweighted Paasche and Laspeyres PPPs that were used to convert gross value added data into the other currency. Converted gross value added data are shown in Table 7.

Table 6
ICP Reweighted Binary PPPs for Gross Value Added,
Wholesale and Retail Trade, Mexico and the USA, 1975/7

	Mexican quantity weights	US quantity weights	Geometric average
(1) Farm products	12.62	17.31	14.78
(2) Food products	7.27	9.77	8.43
(3) Alcoholic beverages and tobacco products	7.48	11.39	9.23
(4) Clothing and footwear	11.75	14.75	13.17
(5) Furniture, furnishings, and appliances	6.84	12.65	9.30
(6) Building materials, hardware	5.54	9.95	7.43
(7) Machinery, equipment, scrap and supplies	15.01	19.54	17.13
(8) Motor vehicles and petroleum products	15.33	16.68	15.99
(9) General line products (a)	9.25	14.15	11.44
(10) Other	12.61	13.12	12.86
TOTAL (All branches)	9.25	14.15	11.44

Source: Kravis, Heston and Summers (1982); detailed ICP augmented binary PPPs for Mexico/USA supplied by Heston.

(a) This branch essentially refers to the activity of department stores. We simpy assumed that the PPP for this branch was the same as the average for the 9 other branches.

Table 7
Single Deflation: Gross Value Added in Wholesale and Retail Trade
Mexico and the USA, 1975/7

	at Mexican "Prices" a)			at US "Prices" b)			Geometric average of column 3 and 6 (Fisher)
	Mexico, 1975 (million 1975 pesos)	USA, 1977	Mexico/ USA (%)	Mexico, 1975 (million 1975 US$)	USA, 1977	Mexico/ USA (%)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Farm products	2,359	222,948	1.06	187	12,883	1.45	1.24
(2) Food products	18,922	487,564	3.88	2,602	49,895	5.22	4.50
(3) Alcoholic beverages and tobacco products	2,137	97,273	2.20	286	8,537	3.35	2.71
(4) Clothing and footwear	5,995	269,067	2.23	510	18,246	2.80	2.50
(5) Furniture, furnishings, and appliances	4,931	321,956	1.53	721	25,450	2.83	2.08
(6) Building materials, hardware	7,047	215,981	3.26	1,272	21,699	5.86	4.37
(7) Machinery, equipment, scrap and supplies	7,916	1,035,126	0.76	527	52,985	1.00	0.87
(8) Motor vehicles and petroleum products	13,763	1,059,115	1.30	898	63,499	1.41	1.36
(9) General line products	5,689	382,079	1.49	615	27,000	2.28	1.84
(10) Other	9,000	358,753	2.51	714	27,354	2.61	2.56
TOTAL (All branches)	77,759	4,449,862	1.75	8,332	307,547	2.71	2.21

Sources: Table 3 and 6.

a) US gross value added converted to pesos with ICP Laspeyres PPPs;
b) Mexican gross value added converted to US$ with ICP Paasche PPPs.

A comparison of Tables 6 and 7 shows clearly that the results of the double deflation technique are very erratic. At Mexican prices, US value added in food products and building materials was negative, and in the other branches, Mexican output varied between 0.45 and 18.05 per cent of the USA. In the case of single deflation the results are more plausible by branch. There are no negative readings and Mexican output varies between 0.76 and 3.88 per cent of the US level (at Mexican prices). At US prices, the double deflation results show no negative value added, but the interbranch range of relative output levels is still very wide. For this reason we conclude that the single deflation results for the 10 branches are to be preferred. Nevertheless we think that the double deflation exercise was useful, and cannot be dismissed on the aggregate level, i.e. for distribution as a whole. It should be noted that the erratic character of our double deflation results is not unusual. Our collegues Szirmai and Pilat (1990) had the same experience in their experiments with double deflation for manufacturing comparisons of Japan and the USA.

Real Product per Capita in Distribution

In Table 8, Mexican gross value added per capita is expressed as a percentage of US gross

value added per capita. Distributive value added per capita in Mexico was only 7.4 per cent of that in the USA at the exchange rate, 8.0 per cent using single deflation and 10.3 per cent using double deflation. This is much lower than the productivity figures, shown below, because Mexico has a much lower proportion of the total population in employment, and also a much lower proportion of the employed are in distribution.

Table 8
Gross Value Added in Wholesale and Retail Trade per Head of Population
Mexico as percent of the USA, 1975/7

	Double Deflation a) at Mexican "prices"	Double Deflation a) at US "prices"	Double Deflation a) Geometric average	Single Deflation b) at Mexican "prices"	Single Deflation b) at US "prices"	Single Deflation b) Geometric average	Exchange rate conversion c)
(1) Farm products	1.6	3.0	2.2	3.9	5.3	4.5	5.4
(2) Food products	d)	27.2	d)	14.2	19.1	16.5	11.1
(3) Alcoholic beverages and tobacco products	19.5	39.7	27.9	8.0	12.3	9.9	7.3
(6) Building materials, hardware	d)	56.6	d)	11.9	21.5	16.0	9.5
(7) Machinery, equipment, scrap and supplies	1.6	1.7	1.7	2.8	3.6	3.2	4.4
(8) Motor vehicles and petroleum products	2.4	2.3	2.3	4.8	5.2	5.0	6.3
(9) General line products	5.9	11.0	8.1	5.5	8.3	6.7	6.2
(10) Other	66.1	12.2	28.4	9.2	9.6	9.4	9.6
TOTAL (All branches)	6.7	15.9	10.3	6.4	9.9	8.0	7.4

Sources: Table 5 and 11.

a) Mexican gross value added data in US$ and US gross value added data in pesos were obtained by subtracting costs (converted to the other currency with ICOP binary PPPs) of goods bought by establishments and other inputs (also converted with ICOP binary PPPs) from sales (converted to the other currency with ICP binary PPPs);
b) Conversion of Mexican and US gross value added with ICP binary PPPs;
c) Mexican gross value added data in pesos were converted to US$ by the exchange rate (i.e. 12.5 pesos to 1 US$);
d) Ratio cannot be calculated because US gross value added at Mexican Prices is negative.

Number and Size of Distributive Outlets in Mexico and the USA

One can see in Table 9 that for all ten branches combined, there are more outlets per head of population in Mexico than in the USA. In food production there were five times as many outlets in Mexico, and about 40 percent more for clothing. In all other branches the Mexican census recorded fewer outlets per head of population than in the USA.

The average size of distributive establishments in shown in Table 10. The average size of US outlets was almost four times that in Mexico. The most pronounced difference in store size was in the trade of food products, 1.7 persons in Mexico compared to 10.3 in the USA.

Table 9
Number of Establishments in Retail and Wholesale Trade
Mexico and the USA, 1975/7

	Number of Establishments		Number of Establishments per 100,000 inhabitants	
	Mexico 1975	USA 1977	Mexico 1975	USA 1977
(1) Farm products	6,231	33,518	10	15
(2) Food products	301,049	258,775	500	117
(3) Alcoholic beverages and tobacco products	5,594	56,877	9	26
(4) Clothing and footwear	58,142	155,973	97	71
(5) Furniture, furnishings, and appliances	10,794	158,258	18	72
(6) Building materials, hardware	17,182	104,477	29	47
(7) Machinery, equipment, scrap and supplies	5,914	116,211	10	53
(8) Motor vehicles and petroleum products	13,929	356,832	23	162
(9) General line products	905	49,987	2	23
(10) Other	34,687	259,085	58	118
TOTAL (All branches)	454,427	1,549,993	755	704

Sources: see Table 3.

Table 10
Average Size of Establishment in Retail and Wholesale Trade Measured by the Number of Persons Engaged, Mexico and the USA, 1975/7

	Mexico 1975	USA 1977
(1) Farm products	2.9	8.9
(2) Food products	1.7	10.3
(3) Alcoholic beverages and tobacco products	4.5	6.1
(4) Clothing and footwear	2.0	7.1
(5) Furniture, furnishings, and appliances	4.7	5.8
(6) Building materials, hardware	4.1	8.5
(7) Machinery, equipment, scrap and supplies	7.3	11.2
(8) Motor vehicles and petroleum products	6.5	7.3
(9) General line products	41.4	45.9
(10) Other	3.2	6.0
TOTAL (All branches)	2.3	9.0

Sources:
Censuses of Wholesale and Retail Trade as described in Table 3.

Employment

Three types of employment can be distinguished. Paid full-time and part-time employees (in Mexico: 'empleados y obreros'), proprietors, and unpaid family workers. In the Mexican census these last two groups are classified under the heading 'personas que trabajaron sin recibir sueldo o salario' (persons working without earning a salary). The Mexican census contains data on the number of paid employees, and of family workers and proprietors combined for each product group. Family workers and proprietors were 51.9 per cent of persons engaged.

Neither of the US censuses provides information on the non-employee part of the work force, but in the case of retailing, the number of proprietors and unpaid family workers was in fact significant. Some proxy measure is therefore required to estimate the number of such workers.

Figures for US proprietors and family workers are contained in *Labor Force Statistics Derived from the Current Population Survey: A Databook* (Bureau of Labor Statistics, 1982). In 1977, there were 254 thousand proprietors in wholesale trade and 1,504 thousand in retail trade; 27 thousand family workers in wholesale trade and 243 thousand in retail trade. This source shows 3,384 thousand paid employees in wholesale trade and 13,631 in retail trade. For total US distribution this meant that proprietors represented a 10.3 per cent addition to paid employees and family workers a 1.6 per cent addition. We used these ratios to derive the total number of working proprietors and family workers in our sample of distribution[6]. Thus we estimated the number of proprietors to be 1,320 thousand and family workers to be 196 thousand. Proprietors and family workers represented an addition of 12.1 per cent to paid employees of our sample which is much lower than in Mexico.

Table 11 lists the number of persons engaged (paid employees, family workers and proprietors) in the various trades in Mexico and the USA. In Mexico, trade in food products accounted for 47.2 percent of employment in distribution. Large shares of total employment in the USA were in the distribution of motor vehicles and petroleum products, food products and general line products. We estimate that employment in distribution as recorded in the Mexican census was 6.7 per cent of total Mexican employment. For the USA, our augmented estimate of distribution employment (excluding family workers) was 14.1 per cent of total US employment.

Neither the Mexican nor the US censuses distinguish between full-time and part-time employees. This is a shortcoming, because labour inputs are inflated when part-time employees form a significant part of the total labour force.

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[6] Ratios of working proprietors to paid employees in wholesale (i.e. 7.5 per cent) and retail trade (i.e. 11.0 per cent) were applied to individual trades to derive the total number of working proprietors in distribution. Family workers were estimated using the same procedure. In wholesale trade, the ratio of family workers to paid employees was 0.8 per cent and in retail trade 1.8 per cent.

Table 11
Persons Engaged (Paid Employees, Family Workers and Proprietors) in Retail and Wholesale Trade and Population (thousands), Mexico and the USA, 1975/7

	Mexico, 1975		USA, 1977	
	Total persons engaged	Of which family workers and proprietors	Total persons engaged	Of which family workers and proprietors
(1) Farm products	18	(7)	299	(23)
(2) Food products	504	(395)	2,655	(279)
(3) Alcoholic beverages and tobacco products	25	(5)	345	(33)
(4) Clothing and footwear	117	(65)	1,102	(120)
(5) Furniture, furnishings, and appliances	51	(10)	913	(89)
(6) Building materials, hardware	70	(17)	892	(85)
(7) Machinery, equipment, scrap and supplies	43	(4)	1,305	(102)
(8) Motor vehicles and petroleum products	90	(12)	2,593	(271)
(9) General line products	37	(1)	2,295	(260)
(10) Other	111	(38)	1,560	(162)
TOTAL ENGAGED IN DISTRIBUTION	1,067	(553)	13,959	(1,424)
TOTAL ENGAGED (Whole Economy)	15,870		98,492[a]	
POPULATION	60,153		220,239	

Sources:
Mexico: SPP (1981), *VII Censo Comercial 1976, Datos de 1975*: Table 7: Principales Caracteristicas por Clase de Actividad y Estrato de Personal Ocupado. USA: Department of Commerce, Bureau of the Census (1981): *1977 Census of Retail Trade* and *1977 Census of Wholesale Trade*. Total population and persons engaged in Mexico estimated from A. Maddison and Associates (1992), *The Political Economy of Poverty, Equity and Growth: Brazil and Mexico*, OUP, New York, Tables B-2 and B-5; USA from Department of Commerce (1992), *National Income and Product Accounts of the United States, Volume 2, 1959-88*, Washington DC.

Note:
The US censuses for 1977 did not include family workers and proprietors, whereas the Mexican census did. The number of proprietors and family workers was estimated as described in the text.

[a] Refers to full-time and part-time paid employees plus self-employed.

Labour Productivity in Distribution

Table 12 shows Mexican and US gross value added per person engaged in national currencies within each branch of distribution, and as a percentage value added per person for total distribution. The lowest percentages in Mexico were found in food products, and clothing and footwear; and in the USA in general line products, and clothing and footwear. The last column shows Mexican gross value added (converted at the exchange rate) per person engaged as a percentage of the USA. Low Mexican productivity was found for food products and high productivity was found in the general line goods, which are mainly department stores.

Table 12
Mexican and US Gross Value Added per Person Engaged in National Currencies

	Mexican gross value added per person engaged (1975 pesos)	Mexican gross value added per person engaged as a % of the average	US gross value added per person engaged (1975 US$)	US gross value added per person engaged as a % of the average	US gross value added per person engaged (converted at the exchange rate) as a % of US productivity
(1) Farm products	128,896	176.8	43,091	195.6	23.93
(2) Food products	37,527	51.5	18,792	85.3	15.98
(3) Alcoholic beverages and tobacco products	84,995	116.6	24,750	112.3	27.47
(4) Clothing and footwear	51,222	70.3	16,560	75.2	24.74
(5) Furniture, furnishings, and appliances	97,487	133.7	27,880	126.5	27.97
(6) Building materials, hardware	100,948	138.5	24,333	110.4	33.19
(7) Machinery, equipment, scrap and supplies	182,470	250.3	40,604	184.3	35.95
(8) Motor vehicles and petroleum products	152,482	209.2	24,486	111.1	49.82
(9) General line products	151,759	208.2	11,766	53.4	103.18
(10) Other	81,529	111.8	17,529	79.6	37.21
TOTAL (All Branches)	72,903	100.0	22,032	100.0	26.47

Sources: Table 3 and 11.

Labour productivity estimated by the double deflation procedure within each branch of distribution is shown in Table 13, Mexican gross value added per person engaged is expressed as a percentage of the US level. Mexican labour productivity for total distribution as a percentage of the US was 23.9 per cent at Mexican "prices" and 56.9 per cent at US "prices". The geometric average (Fisher index) was 36.9 per cent of the US level.

Table 13
Double Deflation: Labour Productivity (Gross Value Added per Person Engaged), Mexico 1975/USA 1977

	at Mexican "Prices" a)			at US "Prices" b)			Fisher
	Mexico, 1975 (million 1975 pesos)	USA, 1977	Mexico/ USA (%)	Mexico, 1975 (million 1975 US$)	USA, 1977	Mexico/ USA (%)	(geometric average) c)
(1) Farm products	138,614	1,754,930	7.9	6,294	43,091	14.6	10.7
(2) Food products	37,527	-182,676	d)	7,362	18,792	39.2	d)
(3) Alcoholic beverages and tobacco products	84,995	116,211	73.1	36,858	24,750	148.9	104.4
(4) Clothing and footwear	51,222	294,312	17.4	6,219	16,560	37.6	25.6
(5) Furniture, furnishings, and appliances	97,487	112,557	86.6	43,514	27,880	156.1	116.3
(6) Building materials, hardware	100,948	-569,832	d)	48,075	24,333	197.6	d)
(7) Machinery, equipment, scrap and supplies	182,470	1,360,155	13.4	5,705	40,604	14.1	13.7
(8) Motor vehicles and petroleum products	152,482	801,690	19.0	4,376	24,486	17.9	18.4
(9) General line products	151,759	153,494	98.9	21,640	11,766	183.9	134.8
(10) Other	79,710	31,956	249.4	8,071	17,529	46.0	107.2
TOTAL (All branches)	72,819	304,796	23.9	12,545	22,032	56.9	36.9

Sources: Table 5 and 11.

a) US gross value added per person engaged converted to pesos with Implicit Laspeyres PPPs for value added data of Table 4-A;
b) Mexican gross value added per person engaged converted to US$ with Implicit Paasche PPPs for value added data of Table 4-A;
c) Geometric average of the Paasche and Laspeyres estimate;
d) Ratio cannot be calculated because US gross value added at Mexican Prices is negative.

Table 14
Single Deflation: Labour Productivity (Gross Value Added per Person Engaged), Mexico 1975/USA 1977

	at Mexican "Prices" a)			at US "Prices" b)			Fisher
	Mexico, 1975 (million 1975 pesos)	USA, 1977	Mexico/ USA (%)	Mexico, 1975 (million 1975 US$)	USA, 1977	Mexico/ USA (%)	(geometric average) c)
(1) Farm products	138,614	745,715	18.6	10,986	43,091	25.5	21.8
(2) Food products	37,527	183,630	20.4	5,161	18,792	27.5	23.7
(3) Alcoholic beverages and tobacco products	84,995	282,009	30.1	11,362	24,750	45.9	37.2
(4) Clothing and footwear	51,222	244,215	21.0	4,358	16,560	26.3	23.5
(5) Furniture, furnishings, and appliances	97,487	352,693	27.6	14,254	27,880	51.1	37.6
(6) Building materials, hardware	100,948	242,198	41.7	18,224	24,333	74.9	55.9
(7) Machinery, equipment, scrap and supplies	182,470	793,250	23.0	12,155	40,604	29.9	26.2
(8) Motor vehicles and petroleum products	152,482	408,404	37.3	9,947	24,486	40.6	38.9
(9) General line products	151,759	166,503	91.1	16,408	11,766	139.5	112.7
(10) Other	79,710	229,897	34.7	6,323	17,529	36.1	35.4
TOTAL (All branches)	72,819	318,784	22.8	7,803	22,032	35.4	28.4

Sources: Tables 7 and 11.

a) US gross value added per person engaged converted to pesos with ICP Laspeyres PPPs of Table 6;
b) Mexican gross value added per person engaged converted to US$ with ICP Paasche PPPs of Table 6;
c) Geometric average of the Paasche and Laspeyres estimate.

Labour productivity results obtained with the alternative single deflation technique are presented in Table 14. As can be seen, the variation between branches of distribution is much smaller compared to the productivity results obtained using double deflation, except for general line products. Overall productivity was estimated 22.8 per cent of the US level at Mexican "prices" and 35.4 per cent at US "prices". The geometric average is 28.4 per cent.

Comparing the Census and National Accounts

Table 15 and 16 compare census (both our sample and the total) and national accounts value added and employment for distribution. Neither of the US or the Mexican national accounts or the respective input-output tables show sales and purchases. What the national accounts define as gross output is in fact an estimate of "gross margins", so the basic procedure of the national accounts is different from that which we followed. Like Maddison and van Ark (1989), we found a major discrepancy between the Mexican census material on which we have mainly relied, and the Mexican national accounts which give a peso estimate for value added in distribution more than two and a half times as high as the census.

We regard the Mexican national accounts with considerable suspicion as they simply ignore the discrepancy with the census. In the USA, the national accounts estimate for distribution is somewhat lower than the census, see Table 15.

The national accounts estimates seem implausible for at least three reasons; a) they show a ratio of distributive services to GDP of 21.5 percent for Mexico compared to 16.9 percent for the USA, whereas one would expect, in line with Barger's (1955) long run finding for the USA, that the richer a country is, the bigger its distributive sector will be; b) if the national accounts estimate were correct it would imply that there is a massive undercoverage of establishments in Mexico which is hardly likely as the census already shows more distributive outlets per head of population in Mexico than in the USA, and the distributive census itself claims to be reasonably comprehensive in its coverage of the sales of the establishments it covers. In fact, the census quotes a survey conducted in the urban regions of Guadalajara and Monterrey, where it was found that the census missed only 10.2 per cent of all establishments, 7.4 per cent of all persons engaged and 1.8 per cent of total sales; c) finally, the national accounts estimates of value added and employment imply a productivity level 71 per cent higher than we estimated from census material. This would make Mexican productivity much higher than that of the USA which seems very implausible.

Table 15
Confrontation of Census Estimates and National Accounts Estimates of of Gross Margins, Other Input Costs, Value Added and Employment in Wholesale and Retail Trade, Mexico, 1975 (million 1975 pesos)

	Census		National accounts
	Our sample	Total	
Sales	313,039	328,554	n.a.
Purchases	210,711	217,332	n.a.
Gross Margin	102,328	111,222	268,867
Other Inputs	24,569	25,774	32,459
Value Added	77,759	85,448	236,407
Persons engaged (1000s)	1,067	1,118	1,886 a)
Value Added per Person Engaged in pesos	72,876	76,429	125,348
in % of our sample	100.0	104.9	172.0

Sources: Census of distribution as described in Table 3. National accounts figures from SPP (1981), Sistema de Cuentas Nacionales de Mexico, Mexico-City.

a) Paid jobs

Note: A number of trades have been excluded from our comparison, because they could not be matched with trades in the USA. Trades excluded from our sample are listed in footnotes 1 and footnotes 1 and 2 on p. 2 and 3.

Table 16
Confrontation of Census Estimates and National Accounts Estimates of of Value Added and Employment in Wholesale and Retail Trade, USA, 1977 (million 1977 US$)

	Census		National accounts
	Our sample	Total	
Sales	1,765,287	1,981,534	n.a.
Purchases	1,355,149	1,502,112	n.a.
Gross Margin	410,138	479,422	n.a.
Other Inputs	74,179	86,514	n.a.
Value Added	335,959	392,908	275,955
Persons engaged (1000s) (excluding family workers)	13,775	19,206	20,761
Value Added per Person Engaged (excluding family workers) in US$	24,388	20,457	13,292
in % of our sample	100.0	83.9	54.5
Persons engaged (1000s) (including family workers)	13,959	19,474	
Value Added per Person Engaged (including family workers) in US$	24,068	20,176	
in % of our sample	100.0	83.8	

Sources: Censuses of distribution as described in Table 3. USA: national accounts value added at factor cost supplied by Robert Parker of the US Department of Commerce. National accounts employment from BEA, The National Income and Product Accounts of the United States, Volume 2, 1959-88, Washington DC (1992).

Note: A number of trades have been excluded from our comparison, because they could not be matched with trades in Mexico. Trades excluded from our sample are listed in footnotes 1 and 2 on p. 2 and 3.

In fact, it would be reasonable for the national accounts to impute distributive services carried out by non-registered street vendors who are not included in the census. But it is implausible to assume that their value added would be so large relative to the organised sector, or that their productivity would be so much higher than in the organised sector. In Brazil, where overall levels of real income and productivity are not too different from Mexico, the national accounts impute only an additional 10 per cent to value added in the organised sector in order to cover the activity of street vendors.

Our Results for Distribution Compared to those for Other Sectors

Table 17 shows Mexican labour productivity (value added per person employed) as a percentage of US labour productivity in other sectors of the economy. These estimates are based on previous ICOP studies done by Maddison and van Ark (1989), Houben (1990), Maddison and Van Ooststroom (1993), and Mulder (1991). Mexican productivity was low in public utilities and transport, and very low in agriculture.

Table 17
Comparative Labour Productivity Performance by Sector (Gross Value Added per Person Engaged), Mexico/USA

	at Mexican "Prices"			at US "Prices"			Fisher
	Mexico, 1975 (million 1975 pesos)	USA, 1977	Mexico/ USA (%)	Mexico, 1975 (million 1975 US$)	USA, 1977	Mexico/ USA (%)	(geometric average)
Agriculture, forestry, fishing 1975/75	n.a.	n.a.	n.a.	982	14,652	6.7	n.a.
Mining, 1975/75	253,507	812,843	31.2	27,934	86,141	32.4	31.8
Manufacturing, 1975/adjusted 1975	131,291	401,937	32.7	10,968	25,765	42.6	37.4
Public Utilities 1975/75	154,445	573,640	26.9	12,708	47,800	26.6	26.8
Construction 1975/1975	57,162	96,674	59.1	9,073	16,526	54.9	57.0
Transport, 1975/75	63,785	246,392	25.9	6,332	19,778	32.0	28.8
Communications, 1975/75	109,367	283,018	38.6	12,565	29,376	42.8	40.7
Financial services and insurance, 1975/75	135,559	255,033	53.2	6,560	16,478	39.8	46.0
Distribution:							
single deflation	72,819	318,784	22.8	7,803	22,032	35.4	28.4
double deflation	72,819	304,796	23.9	12,545	22,032	56.9	36.9

Sources: agriculture: Maddison and van Ooststroom (1993); Mining: Houben (1990); Manufacturing: Maddison and van Ark (1989), revised as shown in van Ark (1993); other sectors from Mulder (1991).

Conclusion

This paper compares levels of gross value added, labour productivity, and PPPs in distribution in Mexico and the USA, relying mainly on the censuses of distribution. Its principal novelty is that gross value added was measured in comparable prices by a process of double deflation. Implicit PPPs were derived for different distributive trades. Results are also presented using a single deflation procedure. Mexican labour productivity in terms of value added per person engaged was found to be 36.9 per cent of that in the USA for double deflation and 28.4 per cent for single deflation. The detailed results for the ten branches using double deflation were quite erratic (see Table 6 and 7 below). At the aggregate level they may have greater validity as errors may be compensating. We conclude that Mexican labour productivity in distribution in 1975 lay in a range between 28.4 and 36.9 per cent of the USA, but the lower of these two figures (using single deflation) probably deserves greater credence. In terms of value added per hour worked it seems likely that Mexican performance would be considerably less than this. US hours worked in distribution were only 33.3 per week. In earlier decades US working hours were much higher because the proportion of small retail outlets open very long hours was much higher. It seems likely that this is still the case in Mexico.

Mexican distribution had four features which are characteristic of lower income economies. In Mexico, the distribution of food products was the biggest type of trade, whereas in the USA, motor vehicles and petroleum products were the biggest. Family workers and proprietors formed a much larger part of the working force in Mexico than the USA. Employment in distribution as a share of total employment was twice as big in the USA compared to Mexico. Average size of US outlets was four times that in Mexico.

Mexican inputs other than purchases of goods for resale were twice the US share. This might be because competition was more severe in the USA than in Mexico, causing lower other inputs ratios to sales. However, it is puzzling that the ratio should differ so widely in the two countries.

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Appendix Tables

(available on request from the authors)

Table A1: Matching of Wholesale Trade and Glossary, Mexico and the USA, 1975/7.

Table A2: Matching of Retail Trade, Mexico and the USA, 1975/7.

Table A3: Matching of Retail and Wholesale Trade, Mexico and the USA, 1975/7.

Table A4: Contents of Summary Groups: Retail and Wholesale Trade, Mexico and the USA, 1975/7.

Table A5: Procedure Used for Deriving ICP Paasche PPPs of ICP III, Mexico, pesos per US dollar, 1975.

Table A6: Procedure Used for Deriving ICP Laspeyres PPPs of ICP III, USA, pesos per US dollar, 1975.

Table A7: Derivation of "Gross Margins" by Double PPP Adjustment (Sales Converted by ICP Paasche PPPs and Purchases by ICOP Paasche PPPs: Retailing and Wholesaling, Mexico, 1975.

Table A8: Derivation of "Gross Margins" by Double PPP Adjustment (Sales Converted by ICP Laspeyres PPPs and Purchases by ICOP Lasperyes PPPs: Retailing and Wholesaling, USA, 1977.

Table A9: Derivation of Gross Value Added (Converting Other Input Costs by ICOP Paasche PPPs), Retailing and Wholesaling, Mexico, 1975.

Table A10: Derivation of Gross Value Added (Converting Other Input Costs by ICOP Laspeyres PPPs), Retailing and Wholesaling, USA, 1977.

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